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THE FIRST ANNUAL MEETING OF THE SOCIETY FOR PLANT MORPHOLOGY AND PHYSIOLOGY.

ERWIN F. SMITH.

FOR some years a move has been on foot to organize in the eastern United States a society for the study of the living plant, *i.e.*, to include all who are actively engaged in botanical studies not purely floristic. The plan was outlined at the meeting of the American Society of Naturalists in Philadelphia in 1895, but not enough botanists were present at that meeting to warrant any attempt at organization. A committee was, however, appointed, with Dr. James E. Humphrey as chairman. This committee reported at the Boston meeting of the American Society of Naturalists, whereupon the botanists present resolved to continue the agitation, and Dr. W. F. Ganong was authorized to see what could be done in 1897 at the Ithaca meeting of the American Society of Naturalists, with which body it was considered best to affiliate. After considerable correspondence, it was decided to call a preliminary meeting and determine wholly by its success or failure whether or not a society should be organized. A meeting was therefore called at Ithaca, N.Y., December 28 and 29. About thirty botanists were present, and much interest was manifested in the proposed new society. Thirty papers were listed on the program, and many of them were of unusual interest. It was therefore decided to complete the organization, which was done by the adoption of by-laws and the election of officers for the ensuing year. It was decided not to meet farther west than Buffalo or south than Washington; and, while it is believed that the bulk of the membership will naturally be drawn from the territory wherein the sessions are held, no geographical restriction was placed on membership. It was also decided that the society has no *raison d'être* unless it actually stands for what its title expresses, the purely floristic work of the country having already ample outlet for its energies. Two standing committees were appointed, one on admissions and the other on programs. Abstracts of papers designed to be read before the society must be in the hands of the program committee, of which the Secretary-Treasurer is chairman, on or before December 1. No one shall be admitted to the society who has not published valuable papers or given satisfactory evidence of ability to do original work. For the present, at least, the society will meet with the American Society of Naturalists. Dr. W. G. Farlow was made President for 1898, and Prof. W. F. Ganong, Secretary-Treasurer. No proceedings will be published. The following new members were elected: Spalding, Webber, Swingle, Rowlee, Harshberger, Fairchild, Harper, Holm, Woods, Hicks, Pieters, Merrow, Porter. The old members, *i.e.*, the original committee, and such persons as were subsequently invited to become members of it, include Farlow, Goodale, Bailey, Atkinson, Smith, Galloway, Burt, Wilson, Sturgis, Richards, Cummings, Macfarlane, Thaxter, Penhallow, Robinson, Greenman, Stone, and Ganong. It is hoped that the end of the year will see the membership of the society increased to at least forty, and it is confidently believed that the ensuing meetings will be even more successful than the pleasant one which has just closed.

The following is a synopsis of the proceedings. In most cases the abstracts were made at my request by the authors themselves:

PROF. JOHN M. MACFARLANE: *A Mycorhiza in the Roots of the Liliaceous Genus Philesia.* This was the second recorded case of symbiosis between a liliaceous plant and a fungus. The genus Philesia grows in the damp humus soil of West Patagonia, and forms coralloid root masses. The fungus was sparingly present outside the roots, also in the epidermis and exocortex, but formed an abundant growth in the mesocortex, the cells of which rapidly became filled with coiled fungous hyphæ. The large spherical starch grains of these cells were acted on by the hyphæ, and were dissolved by solution rather than corrosion. A large amount of proteid material then appeared in the hyphæ. With growth of the root extremity the fungus steadily penetrated the mesocortex cells of the growing point, numerous hyphæ being observed in the tenth to twelfth zone of cells behind the apex. Invariably the crystal cells were left untouched.

The close similarity of the above to cases recorded by Groom for Thismia, and by other authors, was referred to, but the conclusion was reached that, while the fungus might for many generations aid the host in the elaboration of protein compounds that were absorbed by the latter, ultimately, though very gradually, the fungus would prove a destructive agent.

PROF. GEO. F. ATKINSON: *Studies on Some Mycelium and Fungi from a Coal Mine.* On the 14th of September the speaker explored abandoned portions of the Algonquin coal mine near Wilkesbarre, Pa., for the purpose of studying the mycelial formations on the doors in the gangways and on the wood props which are used to support weak places in the roof above. Several flashlight photographs were made of the remarkable displays of the mycelium, some four hundred feet below the surface, and of some of the fruit forms. Mature fruit collected has been determined as follows: *Polyporus versicolor*, *P. annosus*, *Coprinus micaceus*, *Stropharia sp.*, *Hymenochæte sp.*, *Merulius sp.*, etc. The paper was illustrated with lantern views. Some of the mycelial growths entirely covered areas one to two meters square, and were astonishingly luxuriant.

E. A. BURT: *Is there a Basidiomycetous Stage in the Life History of Some Ascomycetes?* The author described cases of close association of *Graphium giganteum* (Pk.), also known as *Dacryopsis ellisiana* (Berk.) Massee, with the discomycete *Lecanidion leptospermum* (Pk.), also known as *Holwaya tiliacea*, E. and E., and believes them to be different stages of the same plant. *Dacryopsis ellisiana* was described as a basidiomycete, and its hymenium and basidia figured by Massee in *Journal of Mycology*, 6: 181. The present study is being carried on, therefore, to decide whether *D. ellisiana* is a basidiomycetous stage of the ascomycete already named. If it is such a stage, the fact will have great significance in determining the relationship to each other of the great classes of fungi, basidiomycetes and ascomycetes.

Specimens of the Dacryopsis collected in August, October, November, and December show only conidial condition, and no true basidia and basidiospores. The conclusion is reached that, until further study demonstrates the presence of basidia, *Graphium giganteum* (Pk.), or *Dacryopsis ellisiana* (Berk.) Massee, should be regarded as a conidial rather than a basidiomycetous stage of the ascomycete *Lecanidion leptospermum* (Pk.).

David G. Fairchild: *Basidiobolus, a Fungus Derivative of the Conjugatæ.* Read by title.

Dr. G. E. Stone: *The Conjugation of Spirogyra.* Read by title.

Dr. G. E. Stone: *Chemotropism in the Peronosporeæ.* Read by title.

Dr. Erwin F. Smith: *Additional Notes on the Bacterial Brown Rot of Cabbages.* Field studies of this disease were made in Michigan, Wisconsin, Ohio, and New York in August, September, and October of 1897. These served to confirm the earlier published statements of the writer[1] respecting the manner of infection and the usual symptoms. A number of new facts which appear to have an important economic bearing were also brought to light. Some of these discoveries are as follows: (1) this disease is serious in many parts of the United States; (2) the greater part of the infections take place through natural openings of the plant, *i.e.*, through water pores located on the serratures of the leaves; (3) the disease is frequently disseminated by insects; (4) the wild mustard, *Brassica sinapistrum*, is one of the common host plants; (5) the disease is very frequently disseminated by man, *i.e.*, by making seed beds on infected soil, and transplanting the germs in infected seedlings to land previously free from it; (6) when a soil has once become infected, there is reason to believe that the germs are capable of living in it for a series of years and will attack cabbages which are planted on it; (7) the disease may be restricted by planting seed beds on healthy soil; by transplanting, as far as possible, to sod land, or at least to land not previously occupied by crucifers; by destroying wild mustards and parasitic insects; by removing badly affected plants bodily; and, in early stages of the disease, *i.e.*, when the disease has only recently passed out of the water-pore stage of infection, by removing affected leaves. A full account of the economic aspects of this disease has been published by the Department of Agriculture in the shape of a *Farmers' Bulletin*, which may be had on application. Cultures of the parasite and dried leaves and stems of cabbage showing the characteristic symptoms were passed around.

Dr. Erwin F. Smith: *Occurrence of Kramer's Bacterial Disease on Sugar Beets in the United States.* Attention was called to the existence in parts of the United States (Michigan, Wisconsin, etc.) of a disease of sugar beets much resembling, if not identical with, that described by Kramer and Sorauer in 1891–92, and more recently by Busse.[1] The root shrivels in places, becomes very black, and finally breaks down here and there with the formation of a sticky exudate composed of bacteria. Cultures from the interior of blackened roots remained sterile. Cultures from the syrupy exudate yielded an organism resembling, so far as tested, that described by Busse as the cause of the disease. It is yet too early, however, to say whether the organism isolated is identical with *Bacillus betæ* Busse, or whether it is in any sense a true parasite. It appears worth mentioning in as much as it seems to be rather common, and destroys cane sugar and grape sugar with the formation of hydrogen, carbon dioxide, and an acid. Possibly this is one of the organisms which has given trouble to the chemists in sugar diffusion work, inverting the cane sugar and liberating gases (see *Journ. Soc. Chem. Ind.*, vol. xiv, p. 876). Cultures on steamed and raw beets, on steamed potato, and in fermentation tubes were exhibited. On steamed slices of sugar beet there is a copious production of gas, which, owing to the viscidity of the bacterial layer, remains for a considerable time imprisoned in little blisters.

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[1] *Science*, June 18, 1897, p. 963, and *Centralb. f. Bakt.*, 2 Abt., July 7, 1897, p. 284.

DR. W. C. STURGIS: *On Some Aspects of Vegetable Pathology and the Conditions which Influence the Spread of Plant Diseases.* Paper withdrawn.

O. F. COOK and DAVID G. FAIRCHILD: *Fungus Gardening as Practiced by the Termites.* Read by title.

DR. W. P. WILSON: *On the Possibility of Securing Botanical and Other Material for Original Research through the Philadelphia Museums.* Read by title.

H. J. WEBBER: *Are Blepharoplasts Distinct from Centrosomes?* After discussing our present understanding of the structure and functions of the centrosome, the speaker pointed out that blepharoplasts are special organs of the spermatic cells of Zamia and Ginkgo, which, in certain stages of their development, somewhat resemble centrosomes. The presence of similar organs in the spermatic cells of certain Filicineæ and Equisetineæ have also been recently described by Belajeff. In Zamia and Ginkgo the blepharoplasts arise *de novo* in the cytoplasm of the generative cells and are located on opposite sides of the nucleus, about midway between the nuclear membrane and cell wall. They increase rapidly in size and are at first surrounded by very numerous radiating filaments of kinoplasm. The division of the generative cell results in the formation of two antherozoid cells, one blepharoplast being contained in each. During this division the blepharoplasts, which have previously lost their radiating filaments of kinoplasm, burst, and the outer membrane of each becomes gradually extended into a narrow helicoid spiral band, from which the motile cilia of the antherozoids are developed. In fecundation this ciliiferous band, formed from the blepharoplast, is left intact at the apex of the archegonium, the nucleus alone taking part. No bodies resembling centrosomes have yet been found in the divisions resulting in the formation of the pollen grain or in the divisions of the egg nucleus after fecundation.

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[1] *Zeit. f. Pflanzenkr.*, Bd. vii, p. 65.

In conclusion it was stated that the blepharoplasts resemble centrosomes: (1) in position, being located on opposite sides of the nucleus near the poles of the future spindle; (2) in having the kinoplasmic filaments focused upon them during the prophases of the division of the generative cell. They differ from typical centrosomes, however: (1) in arising *de novo* in the cytoplasm; (2) in growing to comparatively enormous size; (3) in not forming the center of an aster at the poles of the spindle during karyokinesis; (4) in having a differentiated external membrane and contents; (5) in bursting and growing into a greatly extended cilia-bearing band, the formation of which is evidently their primary function; (6) in their non-continuity from cell to cell. The conclusion reached by the speaker was that in our present understanding of centrosomes the blepharoplasts must be considered as distinct organs.

DR. ROBERT A. HARPER: *Spore Formation in Some Sporangia.* Protoplasmic cleavage and spore formation in types from the genera Synchitrium, Pilobolus, and Sporodinia were described. The division of the multinucleated sporeplasm is neither simultaneous nor by repeated bipartitions, but is accomplished by the progressive growth of narrow cleavage furrows from the surface inwards. In *Synchitrium decipiens* this results in the formation of uninucleated spores, which, by subsequent division of their nuclei, become the resting zoösporangia of this species. In *Pilobolus crystallinus* a similar progressive cleavage produces oval or sausage-shaped masses, which have one or several nuclei. These nuclei now divide, and the plasma masses in which they are also divide by constriction, thus forming ultimately the definitive binucleated spores. In Sporodinia the process is much abbreviated, the primary cleavage furrows simply dividing the protoplasm into relatively few and very unequal multinucleated masses, which round themselves up and are set free at once as spores. In Pilobolus the so-called collar is composed of a slime which is readily distinguished from protoplasm, both by its structure and staining reactions. Cleavage consists in the ingrowth of the plasma membrane. The whole process of spore formation in these sporanges is fundamentally different from that in the ascus, and is strong evidence that ascus and sporangium are not homologous structures.

WALTER T. SWINGLE: *Two New Organs of the Plant Cell.* The author announced the finding of two new organs or organoids; the one, vibrioid, being abundant in the superficial layer of the cytoplasm of some Saprolegniaceæ and some Florideæ, the other being a central body in the developing egg of *Albugo candidus.* The vibrioids are slender, cylindric, sharply delimited bodies about the size of many common bacilli, but exhibiting rather slow bending or undulatory proper motions in addition to transitory movements, which are probably passive and due to the streaming of the cytoplasm in which they are imbedded. They are fixed well by ordinary killing agents, and when stained are very sharply differentiated from the surrounding cytoplasm. They can also be seen in the living cell. Their appearance suggests that they may be minute entoparasites, but their constant occurrence in plants in all stages of development and from widely separated localities militates against this view. Their function is unknown.

The other new organoid is a nearly spherical body, located at one end of the egg nucleus of *Albugo candidus.* It is often a little flattened on the side adjoining the nucleus, is not very sharply delimited from the cytoplasm, but stains differentially. It seems to be more or less granular in structure; it appears just before delimitation of the egg within the oögonium, and disappears after fusion of the male and female nuclei; it probably plays some part in these two phenomena.

Both of the organoids have been observed before, but were not correctly described by previous writers.

B. M. DUGGAR: *Notes upon the Archesporium and Nucleus of Bignonia.* In the microsporangium the archesporium occupies a single boat-shaped layer. The primitive archesporium is differentiated by periclinal division in certain regions of the hypodermal layer, the next divisions in the latter giving rise to the tapetum on the outer side, and the final division of the succeeding hypodermal layer developing that layer often becoming the fibrillar endothecium of authors. In Bignonia there is no fibrillar structure, and, in general, no further periclinal divisions in the regions mentioned. The definitive archesporium is formed by not more than a single anticlinal division of the primitive archesporial cells.

The macrosporic archesporium apparently develops no primary tapetum, divides simultaneously from the two-celled stage, and the third or fourth cell becomes the definitive embryo sac mother cell.

The archesporial nucleus, especially, is peculiar in the large nucleolar-like structure, which is evidently not homogeneous in structure, a portion of it taking the gentian in the Flemming combination.

WALTER T. SWINGLE: *Some Theories of Heredity and of the Origin of Species Considered in Relation to the Phenomena of Hybridization.* Owing to limited time, the speaker treated only the first portion of his theme, *viz.*, the bearing of the facts of hybridization on some theories of heredity. It was pointed out that Weismann's theory of reduction of chromosomes, though giving a plausible explanation of the differences observed between the first (uniform) and second (polymorphic) generations of most hybrids, is not in accord with the observed phenomena of spore and pollen formation in higher plants, and, moreover, fails to account for the extreme polymorphism often observed in the first generation of hybrids of races of cultivated plants or closely related species, as, for example, some racial hybrids of maize and some specific hybrids of Lychnis and Digitalis. Mr. Swingle considered it necessary to assume in some such cases, at least, a predetermination of the characters of the hybrid at the time of fusion of the male and female nuclei.

Since the male and female chromosomes probably persist side by side unchanged in number, and possibly unchanged in quality during the whole of the ontogeny of the hybrid (reduction not occurring until the close of the first generation), it is therefore necessary to assume, in order to explain the observed fact of divergence of character in the first generation of some hybrids, that the influence exerted during ontogeny of the hybrid by the material bearers of heredity is, at least in some cases, a function of their relative positions, and, further, that in most cases the relative positions of these bearers of heredity, as determined at the moment of fusion of the male and female nuclei, would persist unchanged throughout ontogeny of the offspring. Some exceptional cases, such as reversions to the one or the other parent form of a larger or smaller part of the hybrid, would be explained by assuming some change in the disposition of the units of hereditary substance, whereby they assumed a new position of partial or complete stability. It was suggested that possibly the difference between uniform and polymorphic hybrids of the first generation is due to a more complete intermingling of the hereditary particles in case of polymorphic hybrids (offspring of closely related organisms), whereby many differing combinations would be possible, and, in case of uniform hybrids (mostly offspring of distinct species or very different races of the same species), to greater or less aversion to commingling between the two more diverse sorts of particles, whereby but one uniform and stable configuration would result, allowing both sorts of hereditary substance to act equally.

Xenia, or the communication of the paternal characters to parts of the mother plant in the immediate neighborhood of the developing embryo, was held to be well established in case of some races of maize by the work of Dudley, Savi, de Vilmorin, Hildebrand, Körnicke, Sturtevant, Burrill, Kellerman and Swingle, McCluer, Tracy, Hays, and others, and in case of some races of peas by the work of Wiegmann, Gärtner, Berkeley, Laxton, and Darwin. The converse phenomena of the mother plant influencing the characters of the developing embryo is occasionally reported; for instance, in hybrids of Digitalis, by Gärtner, and in hybrids of Nymphæa, by Caspary.

These phenomena are inexplicable by the current theories of heredity, and perhaps in consequence have been neglected. They necessitate the assumption that hereditary influences can be transported from cell to cell for some distance. It was suggested that this transport may occur either along the intercellular filaments which pass through the walls, or by means of diffusible substances capable of acting on the hereditary particles of distant cells. Townsend's proof of the conduction of the stimulus which results in wall formation over long, slender threads of protoplasm in plasmolyzed cells may be considered as hinting the possibility of the former explanation, while Beijerinck's claim that the developing larvæ of some gall insects secrete substances which diffuse into and control the ontogeny of neighboring meristematic or partially developed tissue cells of the host plant foreshadows the latter hypothesis.

DR. G. E. STONE: *Influence of Electricity on Plants.* Read by title.

ALBERT F. WOODS: *Variable Reaction of Plants and Animals to Hydrocyanic Acid.* Experiments cover a period of three years. The plants and animals were exposed in air-tight chambers of known cubic contents for a given period to a definite amount of gas obtained from a solution of 98% (*i.e.*, c. p.) potassic cyanide in 50% sulphuric acid, KCN + H_2SO_4 + aq. Plants of the Coleus group which we have tried will stand in all stages of growth the gas produced from $\frac{15}{100}$ of a gram of 98% cyanide of potassium per each cubic foot of space for 25 minutes. A longer exposure, even for so short a time as 5 or 10 minutes, results in more or less injury, and exposure to the gas from $\frac{20}{100}$ gram per cubic foot for 25 minutes also results in injury. In the latter case, if the time is cut down to 10 minutes the plants may stand the increased dose without injury. The ratio between the doses and the time is not constant. The plants can endure strong doses for a very short time much better than they can a weak dose for a long time. Under conditions where the stomata of the plant are closed, it can resist the gas for a much longer period than it can where they are open. The temperature of the chamber also has an important effect. If it is high, it increases the diffusibility of the gas and decreases the time which the plant can be exposed without injury. If the temperature is low, the time may be lengthened.

Ferns, *e.g.*, Davallias and Adiantums, are able to withstand a slightly longer treatment than Coleus. Even the very youngest developing fronds are not injured at the upper limit of the treatment which would injure the young leaves of Coleus. There are a large number of plants of different families which seem to be able to endure exposure, as indicated for Coleus and Adiantum, without injury. Tomatoes, on the contrary, are very sensitive. All the young growth is killed by an exposure of 15 minutes to the gas from $\frac{15}{100}$ of a gram of 98% KCN per cubic foot of space. In fact, it is hardly possible to give these plants any dose so small that it will not injure some of the young growth. The young growth of roses is also remarkably sensitive, it being almost impossible to treat them without injury. Different varieties of roses, however, seem to differ in this respect. The older leaves of tomatoes and roses are much less susceptible. A curious effect of the poison was noted on tobacco, on *Lilium candidum*, and on tomatoes, where the dose was not great enough to kill the plants, but simply to injure them slightly; all the affected cells lost their chlorophyll, and, although they continued to divide and grow, they were colorless, producing yellowish white blotches in the leaves, especially along the veins. In case of woody stems the cells immediately under the cambium, *viz.*, the youngest wood cells, were most sensitive. In many cases these were killed, much as if by frost, but the stems continued their growth.

Variations of a similar nature were noted also in insects, and some of these are well known to entomologists who use cyanide bottles. Spiders and all of that group seem to be particularly resistant to the poison. The mites are the most resistant organisms thus far studied, but even among species of aphides some are much more sensitive than others. The red mite (*Tetranychus telarius*) is very resistant. In cases where complete paralysis is produced and there are no signs of life for several hours mites frequently recover. Some of the higher animals also behave in the same way.

GILBERT H. HICKS: *Effect of Light on the Germination of Seeds.* Read by title.

A. J. PIETERS: *Effect of Alternating Dryness and Moisture on the Germination of Some Seeds.* The species experimented with were *Chenopodium album*, *Daucus carota*, *Anthemis cotula*, *Arctium lappa*, *Cichorium intybus*, *Dianthus armeria*, *Echium vulgare*, *Datura tatula*, *Malva rotundifolia*, and *Verbascum blattaria*. Two pots were devoted to each species. After the seeds were sown the pots were under uniform and like conditions, the soil being kept continuously moist. After a long period, during which germination had practically ceased, the soil in one of the two pots was allowed to become thoroughly dry, and remained so for two weeks. It was then moistened regularly, whereupon many seeds germinated. This was true of all the species mentioned. Two examples are selected at random from the list. *Daucus carota:* During the first 39 days pot *A* germinated 14%, and pot *B* 15%. No further germinations for 98 days. *A* was then kept dry for 14 days; *B* moist as usual. Germination began in *A* 2 days after watering, and in 4 days *A* germinated 15%, while in the previous 18 days *B* had germinated 0. Both pots were subsequently left dry from August 7 to September 8, and then moistened. Germination in both pots began September 11, and in 17 days *A* germinated 9%; *B*, 30%. *Dianthus armeria:* In first 111 days *A* germinated 32%; *B*, 42%. *A* was then dried 14 days, while *B* was continued moist. Beginning July 27, *A* was moistened regularly. On July 30, germination began in *A*, and in 10 days *A* germinated 52%. During the previous 24 days *B* germinated 0. Both pots were dry from August 7 to September 8, then both were regularly moistened. Germination began September 13. In 15 days *A* germinated 2%, and *B* 40%. Equally striking results were obtained with other species. In many cases germination began in the dried-out pots within 48 hours, and in some cases within 24 hours after the watering. A few other species which had shown no germinations in the moist soil were not affected by this treatment. These experiments will be repeated and extended before final publication.

PROF. GEO. F. ATKINSON: *Experiments on the Morphology of Arisæma triphyllum.* Female, male, and neuter plants, the history of which was known by growing them in pots for one season, were potted, some in rich soil and others in poor soil, the object being to change them from male to female, etc., by varying amounts of nutriment. Male plants in rich soil were in one year changed to female, and large neuter plants in rich soil were changed to female.

In a second series, large two-leaved female plants with large corms were selected at the time the rudiment of the flowers was formed. The corms were cut so as to remove all but a small portion in connection with the bud and then set out. By removal in this manner of the larger part of the stored food, the plants were changed to male. A collection of these plants was exhibited.

DR. W. F. GANONG: *Upon Polyembryony and its Morphology in Opuntia vulgaris Mill.* The author has found this species markedly polyembryonic, the polyembryony having a double morphological basis. One set of embryos comes from a mass of tissue which appears to develop from the fertilized egg cell, and others spring from the wall of the embryo sac and seem to arise from endosperm cells. If this be true, it is a mode of origin hitherto unknown. The literature of the subject was summarized, and some remarks given upon the significance of polyembryony. Many species of cactus were worked over (eighty or ninety), and no other cases observed.

DR. W. F. GANONG: *Contributions to the Morphology and Biology of the Cactaceæ. Part II, The Comparative Morphology of the Embryos and Seedlings.* The paper is a continuation of the author's earlier studies upon this family. It describes and figures germinated embryos of most of the genera and the more important species, discusses the germination and growth of the embryos, their form, size, and color factors, and the features they show of importance for the determination of the phylogeny of the genera, the development of the seedlings, and the unfolding of the peculiar morphological features of the adult plants. Contrary to Pfeifer, the morphology of the group is of systematic importance. A tree of descent was exhibited. Anhalonium and some other genera were shown to belong with genera from which they have heretofore been widely separated. Many interesting drawings were exhibited.

DR. W. W. ROWLEE: *The Morphological Significance of the Lodicules of Grasses.* This study was based on an examination of bamboo flowers, in which genus three to six lodicules are present. In floral structures the bamboos are believed to represent the primitive type of grass flower. Evidence obtained from an examination of numerous sections of the bamboo flower indicate that the lodicules must be regarded as the remnants of a perianth. The three lodicules in Arundinaria alternate on the axis with the stamens, and may, therefore, be considered the inner whorl, or petals. The stamens are directly opposite the midribs of the carpels, and indicate that the inner whorl of stamens, present in some bamboos, is suppressed in Arundinaria. Hackel, as is well known, interpreted the lodicules as distichous bracts. The paper was illustrated by lantern slides.

DR. LUCY L. W. WILSON: *Observations on the American Squawroot (Conopholis Americana Wallr.).* An exhaustive study of the vegetative and reproductive parts has been made, but an account of the former only was read. The invariable host plant is the oak. The extreme degradation of the parasite and the intimate relation between it and the oak roots caused the author to compare it with members of the Balanophoreæ and Rafflesiaceæ, rather than with parasitic members of the Scrophulariaceæ. The seedling parasite seemed early to attack young oak roots, and steadily grew for ten to twelve years until a huge mass six inches across might be formed. This mass was characterized chiefly by the abundance of sclerenchyma patches developed by the oak host through the irritant action of the invading parasite. The presence of stomata on the stem and their absence on the scale leaves was pointed out, while the double circle of bundles traversing the flowering stem is peculiar in that the xylem of one of these sets of bundles faces the xylem in the other.

DR. JOHN W. HARSHBERGER: *Water Storage and Conduction in Senecio præcox DC. from Mexico. Senecio præcox* (Cav.) DC. is a plant with a succulent, woody, cylindrical stem growing on lava beds in the valley of Mexico. It has clustered leaves at the top of the stem and stores up water in disk-like plates of pith. During the dry season the plant develops its corymb of composite flowers, and in doing so uses the water stored up in the pith. The loss of this water is prevented during the dry season by the fall of the leaves and by a protective cork and balsam, the latter secreted in the exocortex and endocortex. The leaves show no xerophytic structure. The water stored in the turgid disks of pith is gradually conducted by the woody cells and tracheids to the growing point. That the water in the pith is a reserve supply is shown by examination of a piece of stem, which was still alive and sending out small green leaves and short shoots, although it had been cut and in a dry place for over sixteen months. In this stem the turgid disks of pith were contracted into parchment-like membranes or partitions. Conduction of water in the stem was accomplished without the assistance of root pressure and without the aid, to any appreciable extent, of the transpiration from the extremely small leafy crown.

K. M. WIEGAND: *Notes on the Embryology of Potamogeton. Potamogeton pauciflorus* was studied with regard to the origin and development of the embryo sac, fertilization, and the development of the embryo. The embryo sac was found to arise in the normal manner for monocotyledons, *viz.*, from the subepidermal cell after the cutting off of a tapetal cell. The egg apparatus and antipodals were, however, somewhat abnormal. Although the normal number of cells in each was present, they were formed irregularly. The polar nucleus and first and second synergides seem to have been cut off successively from the mother nucleus of the egg. The synergides disappear almost immediately. A similar irregularity was found in the antipodals; but the most interesting feature, perhaps, was the fact that the definitive nucleus cuts off a very large basal nucleus, as in Sagittaria, before endosperm formation proceeds in the upper portion of the sac.

DR. ADELINE SCHIVELY: *Recent Experiments and Observations on Fruit Production in Amphicarpæa monoica.* Her published observations show that minute aerial cleistogamous flowers when buried produce one-seeded "nuts" with soft fruit and seed coats, instead of the typical two to three-seeded pods with indurated walls.

She now shows that when purple flowers are buried, in the bud state, while still attached to the plant, or at any period up to the time of fertilization, perfect underground "nuts" mature instead of three to four-seeded pods. Various conclusions were drawn as to the powerful action of environmental agents in determining the size, shape, and consistence of the seed, the induration of its coats, and the number of seeds that might be produced.

DR. MARTHA BUNTING: *On the Formation of Cork Tissue in the Roots of the Rosaceæ.* Starting with observations on *Geum urbanum* and *Geum rivale* made by Professor Macfarlane in 1890, where intercellular spaces were shown to exist between the cork cells, she proved this condition to be typical for all herbaceous and shrubby species examined, but to be absent in roots of arborescent species. She described the alternation of a flattened, usually pigmented, layer of cells with one to three layers of rounded cells in each annual ring, the flattened layer being the last produced each season. Protoplasm, nuclei, and starch grains exist in cork zones four to five rings removed outside the phellogen.

MISS CAROLINE THOMPSON: *The Structure and Development of Internal Phloem in Gelsemium sempervirens Ait.* The phloem originates as four longitudinal tracts in the primary meristem and steadily increases, until by the eighth or tenth year it has entirely pressed together and destroyed the pith. During the first year nourishment of the pith ceases, owing to the differentiation of two layers of cells, which were referred to as the "phloem sheath."

A remarkable distribution of the internal phloem was shown to exist in the petiole, at the base of which a bicollateral bundle arrangement exists, but this quickly changes to the ordinary collateral relation by the passage of the upper (internal) phloem through the xylem of the petiole. Each bundle in passing out into the petiole subdivides into three parts, two of which remain in the stem and soon reunite, while the third passes out and behaves as above described.

From the second year onward, the internal phloem patches of the stem show areas of crushed and obliterated tissue where the previously formed phloem has been pushed inwards by the younger elements. In older stems eight large phloem patches, formed by division of the original four, entirely fill up the pith area.